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PROMOTING THE PROGRESS OF SCIENCE

MARCH 3 (legislative day, FEBRUARY 21), 1949.—Ordered to be printed

Mr. THOMAS of Utah, from the Committee on Labor and Public Welfare, submitted the following

REPORT

[To accompany S. 247]

The Committee on Labor and Public Welfare, to whom was referred the bill (S. 247) (introduced by Mr. Thomas of Utah, for himself, Mr. Kilgore, Mr. Fulbright, Mr. Magnuson, Mr. Smith of New Jersey, Mr. Cordon, and Mr. Saltonstall) to promote the progress of science; to advance the national health, prosperity, and welfare, to secure the national defense; and for other purposes, having considered the same, report favorably thereon, without amendments, and recommend that the bill be adopted.

GENERAL STATEMENT

For a number of years there has been a Nation-wide demand for the creation of a National Science Foundation. The need for the creation of such an organization has been repeatedly recognized in the official statements of Presidents; in the hearings, conferences, and debates of several Congresses; and in the writings and statements of outstanding scientists, educators, students, and industrialists.

The subject matter of this proposed legislation has been carefully considered and thoroughly studied by a number of committees and subcommittees of both Houses during the Seventy-ninth and Eightieth Congresses. The public hearings conducted on this question encompass more than 1,000 pages of printed testimony submitted by more than 150 qualified witnesses. The need for the enactment of this type of legislation was uniformly attested to by officials of Government, military leaders, outstanding scientists and educators, as well as by representatives of labor, industry, and the clergy. Moreover, a number of public and private organizations submitted written communications urging the early establishment of a National Science Foundation.

The various hearings and studies conducted by the Congress reveal a severe shortage of skilled scientists. This shortage is apparent in

universities, private research institutions, Government agencies, and in private industry. This shortage has resulted in a spirited competition among the various users of scientific manpower, with the result that long-range research programs are threatened with flux and instability. The shortage of American men and women holding advanced degrees in the sciences has reached an alarming figure—an accumulated deficiency of 17,000 doctor's degrees alone has been reported—the result of a consistent neglect of scientific educational opportunities over the years.

These hearings and studies, in addition to establishing the grave need for more trained scientists in America, also establish the need for greatly stimulating American research in the basic sciences, as contrasted with applied science, as well as providing a responsible program of directing and coordinating such basic research.

While there can be little question that American industry is well equipped to carry forward comprehensive research programs in the field of the applied sciences, the fact remains that American industry enjoys no such secure position with respect to research in the fields of basic or pure science.

Spokesmen for industry have revealed that more than 150,000 industrial establishments have no basic research facilities whatever, and that those establishments with such facilities are pursuing goals which are peculiar to their own interests, without proper coordination with the general basic research problems of the Nation.

The imperative need for greatly increasing the activities of this Nation in the field of basic research is strongly set forth by Dr. Vannevar Bush, wartime head of the Office of Scientific Research and Development, in his final report entitled "Science: The Endless Frontier":

> Our national preeminence in the fields of applied research and technology should not blind us to the truth that, with respect to pure research—the discovery of fundamental new knowledge and basic scientific principles—America has occupied a secondary place. Our spectacular development of the automobile, the airplane, and radio obscures the fact that they were all based on fundamental discoveries made in nineteenth-century Europe. From Europe also came formulation of most of the laws governing the transformation of energy, the physical and chemical structure of matter, the behavior of electricity, light, and magnetism. In recent years the United States has made progress in the field of pure science, but an examination of the relevant statistics suggests that our efforts in the field of applied science have increased much faster so that the proportion of pure to applied research continues to decrease.
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> Several reasons make it imperative to increase pure research at this stage in our history. First, the intellectual banks of continental Europe, from which we formerly borrowed, have become bankrupt through the ravages of war. No longer can we count upon those sources for fundamental science. Second, in this modern age, more than ever before, pure research is the pacemaker of technological progress. In the nineteenth century, Yankee mechanical ingenuity, building upon the basic discoveries of European science, could greatly advance the technical arts. Today the situation is different. Future progress will be most striking in those highly complex fields—electronics, aerodynamics, chemistry—which are based directly upon the foundation of modern science. In the next generation, technological advance and basic scientific discovery will be inseparable; a nation which borrows its basic knowledge will be hopelessly handicapped in the race for innovation. The other world powers, we know, intend to foster scientific research in the future.

The foregoing facts make it apparent that the security of America requires prompt and effective action in the field of basic scientific research—in the training of manpower, in the encouragement and stimulation of basic research activities, and in the effective coordina-

tion of such activities into a sound, progressive national policy of scientific development. It is the considered belief of your committee that the enactment of S. 247, as reported, will go far toward meeting this pressing American need.

Background of S. 247

Over the years, a considerable number of bills designed to create a National Science Foundation have been introduced in the Congress. These bills, while they were designed to achieve the same general objectives, differed widely and fundamentally in philosophy and approach. With the passing of time, these differences have gradually been reconciled and adjusted, until today there is a broad basis of agreement as to the principal provisions which any National Science foundation legislation should contain. Those provisions are embodied in S. 247.

During the first session of the Eightieth Congress, S. 526, a bill to create a National Science Foundation was passed by both the Senate and the House. That bill was vetoed by the President on August 6, 1947. But in withholding his approval of S. 526, the President manifested his interest in the enactment of legislation of this type in these words:

> I take this action with deep regret. On several occasions I have urged the Congress to enact legislation to enact a National Science Foundation. Our national security and welfare require that we give direct support to basic scientific research and take steps to increase the number of trained scientists.

He then urged the Congress to "reconsider this question and enact such a law early in the next session."

Early in the second session of the Eightieth Congress, a series of conferences, designed to reconcile the divergent views of the executive and legislative branches of the Government (as reflected in the President's memorandum of disapproval and S. 526, respectively), was conducted by a number of congressional and administration representatives. As a result of these conferences, and in the light of the most recent developments in this important field, a new National Science Foundation bill, S. 2385, was introduced in the Senate on March 25, 1948. That bill was favorably reported, with amendments, by a unanimous vote of the Labor and Public Welfare Committee on April 20, 1948, and it passed the Senate, as reported, on May 5, 1948.[1]

The pending proposal, S. 247, is identical with S. 2385 as approved by the Senate in the Eightieth Congress, and it represents the culmination of the years of study and experience outlined above.

Conclusion

It is the considered opinion of your committee, based upon a careful investigation of the various hearings, investigations, and reports which have been devoted to this subject, that there is an impelling need for the early enactment of legislation designed to cope with the serious problems confronting this Nation in the field of basic scientific research. These problems are reflected in a serious shortage of manpower trained in the sciences, in a dearth of basic research under-

[1] On June 4, 1948, a bill similar to, but not identical with, S. 2385, was reported in the House of Representatives, but no further action was taken by that body before the final adjournment of the 80th Cong.

takings both inside and outside of the Government, and in the need for an effective stimulation and coordination of basic research programs. It is also the belief of your committee that the provisions of S. 247, based upon years of legislative investigation and experience, represent a sound and effective approach to these problems. For these reasons, your committee unanimously approves S. 247 and urgently recommends its early and prompt enactment.

Analysis, by Sections, of S. 247

SHORT TITLE

Section 1: This section provides that the act may be cited as the "National Science Foundation Act of 1949."

ESTABLISHMENT OF A NATIONAL SCIENCE FOUNDATION

Section 2: This section establishes the National Science Foundation in the executive branch of the Government as an independent agency.

MEMBERSHIP OF THE FOUNDATION

Section 3: This section provides that the Foundation shall consist of 24 members, appointed by the President by and with the advice and consent of the Senate. The members of the Foundation must be persons eminent in the fields of science, engineering, education, or public affairs, selected solely on the basis of established records of distinguished service. In making appointments, the President is requested to consider recommendations submitted to him by recognized scientific and educational associations, including the National Academy of Sciences, the Association of Land Grant Colleges and Universities, the National Association of State Universities, the Association of American Colleges, and other scientific and educational organizations.

Moreover, appointments are to be made in a manner which will provide representation of the views of scientific leaders in all areas of the Nation. The members of the Foundation shall serve for a term of 6 years, with a limit of 12 years' continuous service:

POWERS AND DUTIES OF THE FOUNDATION

Section 4: This section authorizes and directs the Foundation (1) to develop a national policy for promoting basic research and scientific education; (2) to make grants and loans for research; (3) after consultation with the Secretary of Defense, to support research for national defense; (4) to award scholarships and fellowships; (5) to foster interchange of information among scientists in the United States and foreign countries; (6) to correlate the Foundation's program with other public, and with private research; and (7) to establish such special commissions as the Foundation may from time to time deem advisable.

This section contains an admonition against geographic concentration of activities. It further provides for selection of a chairman and vice chairman by the Foundation, the submission of an annual report,

and the appointment of such committees, including an executive committee, as the Foundation deems necessary.

DIRECTOR OF THE FOUNDATION

Section 5: This section sets forth the powers and functions of the Director of the Foundation. Throughout the history of this legislation, the matter of the powers and duties of the Director and the manner of his appointment or removal has been a serious and controversial problem. The language of this section, as set forth below, represents an approach to that problem which has the support of nearly all those who have expressed an interest in the enactment of this legislation:

SEC. 5. There shall be a Director of the Foundation who shall be appointed by the President by and with the advice and consent of the Senate, after the members of the Foundation have been appointed and qualified. He shall serve as an ex officio member of the Foundation. In addition thereto he shall be the chief executive officer of the Foundation. The Director shall receive compensation at the rate of $15,000 per annum and shall serve for a term of six years unless sooner removed by the President.

DIVISIONS WITHIN THE FOUNDATION

Section 6: This section provides for four divisions within the Foundation as follows: (1) A Division of Medical Research; (2) a Division of Mathematical, Physical, and Engineering Sciences; (3) a Division of Biological Sciences; and (4) a Division of Scientific Personnel and Education, which is to be concerned with the program of the Foundation relating to the granting of scholarships and graduate fellowships in the mathematical, medical, biological, engineering, and other sciences.

The following language: "There shall be within the Foundation such other divisions as the Foundation may, from time to time, deem necessary," was so phrased to permit the Foundation to explore the needs of the social sciences, and to take appropriate action.

DIVISIONAL COMMITTEES

Section 7: This section provides that there shall be a divisional committee for each division of the Foundation. These divisional committees are to be appointed by the Foundation; they are to consist of not less than five persons who may or may not be members of the Foundation. Each such committee is to make recommendations to, and advise and consult with the Foundation and the Director with respect to the program of its division.

SPECIAL COMMISSIONS

Section 8: This section authorizes the Foundation to appoint special commissions. Each such commission would "make a comprehensive survey of research both public and private being carried on in its field" and "formulate and recommend to the Foundation" an over-all research program. Previous bills made mandatory the creation of special commissions for cancer, heart disease, poliomyelitis, and certain other afflictions. Your committee has left the matter of

designating special commissions to the Foundation, in order that the Foundation may act effectively to meet pressing needs as they arise in various scientific fields.

SCHOLARSHIPS AND GRADUATE FELLOWSHIPS REGISTER OF SCIENTIFIC PERSONNEL

Section 9: This section authorizes the Director, with the approval of the Foundation, to award scholarships and fellowships to outstanding students to pursue studies in accredited nonprofit institutions of the student's own choice. Selections are to be made on the basis of ability; where ability is substantially equal among two or more contenders, selection is to be made so as to result in a wide geographical distribution of scholarships and fellowships. A roster of scientific personnel is to be maintained.

AUTHORITY OF THE FOUNDATION

Section 10: This section empowers the Foundation to do everything necessary to carry out the provisions of the act. In addition, this section specifically authorizes the Foundation to (*a*) make rules and regulations; (*b*) make expenditures; (*c*) enter into contracts for research within or without the United States; (*d*) make advance payments, progress payments, and other payments; (*e*) acquire and hold property; (*f*) receive and utilize donations; (*g*) disseminate information; (*h*) accept voluntary services; and (*i*) account for funds.

PATENT RIGHTS

Section 11: This section provides that each contract or other arrangement executed pursuant to the act which relates to scientific research shall contain provisions governing the disposition of inventions produced thereunder in a manner calculated to protect the public interest and the equities of the individual or organization with which the contract or other arrangement is executed, but the Foundation may not, by any contractual or other arrangement, alter or modify any provision of law affecting the issuance or use of patents. This section prohibits officers and employees of the Foundation from acquiring, retaining, or transferring any rights, under the patent laws of the United States or otherwise, in any invention which such officer or employee may make or produce in connection with the performance of his assigned activities and which is directly related to the subject matter thereof.

INTERNATIONAL COOPERATION

Section 12: This section authorizes the Foundation to cooperate in any international scientific research activities consistent with the purposes and provisions of this act. This section authorizes the Director, with the approval of the Foundation, to defray the expenses of representatives of Government agencies, other organizations, and of individual scientists in attending international scientific congresses and meetings.

APPROPRIATIONS

Section 13: This section authorizes such appropriations as may be necessary for the Foundation. Any money so appropriated, if obligated in the year of appropriation, is to remain available for expenditure for 4 years thereafter. This provision is necessary in view of the long-range nature of many of the projects which will be undertaken by the Foundation. A similar provision is contained in the act of August 1, 1946, establishing an Office of Naval Research.

GENERAL PROVISIONS

Section 14: This section provides that the Director, with the approval of the Foundation, may appoint his own Deputy Director. The Director and his deputy are to devote full time to the Foundation. Other provisions of this section include per diem allowances for members; procedures to be followed in the employment of necessary personnel; a prohibition against operating laboratories or pilot plants by the Foundation itself; a provision against encroachment on other Government activities; transfer of the National Roster of Scientific and Specialized Personnel from the Department of Labor to the Foundation at the instance of the President; denial of participation in the field of atomic energy without the concurrence of the Atomic Energy Commission, and denial of any interference with the provisions of the Atomic Energy Act; and consultation with the Secretary of Defense and thereafter publication of regulations for the security classification of information or property in connection with scientific research.

COORDINATION WITH FOREIGN POLICY

Section 15: This section requires that contractual arrangements involving foreign countries or individuals in foreign countries conform to the foreign policy of the United States. Any negotiations with foreign countries in conformation with the National Science Foundation Act are required to be carried on by the Secretary of State.